

Beamline 4-ID / SRI-CAT

Scientific focus: Synchrotron instrumentation and techniques and use of polarized x-rays

Scientific programs: Development of polarization optics/techniques for 0.5–100 keV (magnetic circular dichroism, resonant magnetic scattering, and fluorescence), and development of high-heat-load front-end components.

Optics & Optical Performance

Hard x-ray branch optics and optics performance

- double-crystal monochromator
 - 3.0–45.0 keV energy range Si(111)
 - 5 mm hor. x 2 mm vert. acceptance
 - 1°–60° Bragg angle rotation range
 - 10 arcsec Bragg accuracy
 - 0.5 arcsec resolution
 - 10–35 mm beam offset, variable
 - liquid-nitrogen cooling
- mirror
 - two groove, torroidal figure
 - 80.5 mm sagittal radius, focusing
 - 345 mm sagittal radius, collimating
 - 18–7 km meridional radius, adjustable
 - 800 mm L x 30 mm W
 - 1.5–3.85 mrad angular range
- mirror
 - flat
 - 1.5–3.85 mrad angular range

Intermediate x-ray branch optics and optics performance

- horizontal focusing mirror M1C
 - 28.6 m from source
 - 1.1° incident angle
 - plane figure
 - Pt, Rh, Si
- horizontal focusing mirror M2C
 - 31 m from source
 - 1.1° incident angle
 - spherical figure (R=1610 m)
 - Pt, Rh, Si
- vertical focusing mirror M3C
 - 41.4 m from source
 - 1.00° incident angle
 - spherical figure
 - Rh coating

- spherical grating monochromator
 - 50 m from source
 - 0.5–3.0 keV energy range
 - 10^{-3} – 10^{-4} monochromaticity $\Delta E/E$
 - 2.5 mm hor. x 0.25 mm vert. beam size
 - 10^{11} – 10^{13} ph/sec flux at sample

Experiment Stations

4-ID-A

- white beam first optic enclosure

4-ID-B and -D

- white and monochromatic “hard” x-ray
- stations

4-ID-C

- intermediate x-ray station

Beamline Controls and Data Acquisition

- Sun UNIX running Epics with VME, SPEC

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Circularly Polarized Undulator (nominal)*

period	12.8 cm
length	2.3 m
effective K_{mk} (for both horizontal and vertical fields)	2.65
peak field B_{mk}	0.28 Tesla
maximum currents at B_{mk}	1.4 kA horizontal 0.32 kA vertical
energy range 1st harmonic (helical mode)	0.44 - 3.0 keV
energy range 1st harmonic (linear mode)	0.8 - 3.0 keV
energy range 1st - 5th harmonics (linear mode)	0.8 - 10.0 keV
on-axis peak circular brilliance at 1.5 keV	1.0×10^{18} ph/sec/mrad ² /mm ² /0.1%bw
on-axis peak linear brilliance at 1.9 keV	7.0×10^{17} ph/sec/mrad ² /mm ² /0.1%bw
source size at 1.5 keV \sum_x \sum_y	359 μrad 21 μrad
source divergence at 1.5 keV $\sum_{x'}$ $\sum_{y'}$	27 μrad 14.7 μrad

Insertion Device Source Characteristics (nominal)*

source	Undulator A
period	3.30 cm
length	2.47 m
effective K_{max} (at minimum gap = 10.5 mm)	2.78
energy range 1st harmonic	2.9 - 13.0 keV
energy range 1st - 5th harmonics	2.9 - 45.0 keV
on-axis peak brilliance at 6.5 keV	9.6×10^{18} ph/sec/mrad ² /mm ² /0.1% bw
source size at 8.0 keV \sum_x \sum_y	359 μm 21 μm
source divergence at 8.0 keV $\sum_{x'}$ $\sum_{y'}$	24 μrad 6.9 μrad

* Sector 4 will be equipped with two canted insertion devices, a standard Undulator A and an elliptically polarized undulator.